ATMOSPHERIC TRANSMISSION

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Table I gives the values of the water vapor error function absorption coefficients, β, for infrared radiation in the wavelength region from 1.4 microns to 5.9 microns. These values correct the data of L. Larmore* IRIS Proceedings, Vol. I, No. 1, p. 14, so as to agree with the implications of the following experimental data:

A. Gebbie et al., Proc. Roy. Soc. A 206, 87 (1951) [After correction for CO_2 absorption and atmospheric scattering over the experimental path.]

B. Elder and Strong, Jour. Franklin Inst., Vol. 255, No. 3, pp. 189-208 (1953).

C. Burch, D. and J. N. Howard, Air Force Cambridge Research Center, Scientific Report 2 Contract AF 19(604)-516.

The resultant actual transmission values:

$$T = 1 - \mathrm{erf}\left(\frac{\beta}{2}\sqrt{x\,w}\right)$$

have been recalculated for these revised β's for various amounts of precipitable water vapor, w, and are given in Table II as a function of wavelength in the 1.4 to 5.9 micron region in 0.1 μ intervals.

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TABLE I

H_2O Error Function Absorption Coefficient, β (Sea Level Conditions)

λ (Microns)	β ($cm^{-1/2}$)	λ	β
1.4	0.70	4.6	0.40
1.5	.04	4.7	.50
1.6	.02	4.8	.60
1.7	.02	4.9	.70
1.8	2.1	5.0	.85
1.9	.4	5.1	1.15
2.0	.15	5.2	1.55
2.1	.04	5.3	2.10
2.2	.02	5.4	2.80
2.3	.04	5.5	4.0
2.4	.20	5.6	5.3
2.5	.70	5.7	7.3
2.6	4.0	5.8	11.4
2.7	7.3	5.9	11.4
2.8	6.0		
2.9	3.2		
3.0	1.5		
3.1	1.0		
3.2	0.75		
3.3	.50		
3.4	.27		
3.5	.12		
3.6	.06		
3.7	.04		
3.8	.02		
3.9	.02		
4.0	.03		
4.1	.04		
4.2	.06		
4.3	.11		
4.4	.20		
4.5	.30		

TABLE II

INFRARED ATMOSPHERIC TRANSMITTANCE H_2O VAPOR (SEA LEVEL)

λ in Microns	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
W = .01 cm.	. 93	.997	.998	.998	.792	. 96	.985	.997	.998	.997	.980	.930
.02	902	994	997	997	707	943	979	994	997	994	972	902
.05	844	991	996	996	555	911	966	991	996	991	955	844
.10	782	988	994	994	406	874	953	988	994	988	937	782
.2	695	982	991	991	239	822	933	982	991	982	911	695
.5	536	972	986	986	062	723	894	972	986	972	860	536
1.0	381	960	980	980	008	617	851	960	980	960	802	381
2	216	944	972	972	0	478	790	944	972	944	723	216
5	064	911	956	956	0	262	674	911	956	911	574	064
10	005	874	937	937	0	113	552	874	937	874	428	005
20	0	823	911	911	0	024	401	823	911	823	263	0
50	0	724	860	860	0	0	184	724	860	724	076	0
100	0	616	802	802	0	0	06	616	802	616	012	0

TABLE II (Cont.)

λ in Microns	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7
W = .01 cm.	.617	.361	.453	.689	.851	.900	.925	.950	.973	.988	.994	.997
.02	479	196	289	571	790	860	894	930	962	983	992	994
.05	261	040	092	369	673	779	833	888	939	973	987	991
.10	110	004	017	205	552	692	766	843	914	962	982	988
.2	002	0	001	073	401	574	674	779	880	946	973	982
.5	0	0	0	005	184	375	506	658	811	915	958	972
1.0	0	0	0	0	060	210	347	531	735	881	947	960
2	0	0	0	0	008	076	184	377	633	832	916	944
5	0	0	0	0	0	005	035	161	448	736	866	911
10	0	0	0	0	0	0	003	048	285	635	812	874
20	0	0	0	0	0	0	0	005	130	502	738	823
50	0	0	0	0	0	0	0	0	017	287	596	724
100	0	0	0	0	0	0	0	0	001	133	452	616

TABLE II (Cont.)

λ in Microns	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
W = .01 cm.	.998	.998	.997	.997	.994	.991	.980	.970	.960	.950	.940	.930
.02	997	997	995	994	992	984	972	958	943	930	915	902
.05	995	995	993	991	987	975	955	932	911	888	866	844
.10	994	994	990	988	982	972	937	905	874	843	812	782
.2	991	991	987	982	973	950	911	866	822	779	736	695
.5	986	986	977	972	958	937	860	790	723	658	595	536
1.0	980	980	970	960	947	910	802	707	617	531	452	381
2	972	972	960	944	916	873	723	595	478	377	289	216
5	956	956	930	911	866	800	574	400	262	161	117	064
10	937	937	900	874	812	722	428	235	113	048	018	005
20	911	911	870	823	738	615	263	093	024	005	001	0
50	860	860	790	724	596	425	076	008	0	0	0	0
100	802	802	700	616	452	260	012	0	0	0	0	0

TABLE II (Cont.)

λ in Microns	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9
W = .01 cm.	.915	.885	.846	.792	.726	.617	.491	.361	.141	.141
.02	880	839	784	707	611	479	331	196	044	044
.05	811	747	664	555	432	261	121	040	001	001
.10	736	649	539	406	268	110	029	004	0	0
.20	634	519	385	239	116	035	002	0	0	0
.5	451	308	169	062	013	0	0	0	0	0
1.0	286	149	052	008	0	0	0	0	0	0
2	132	041	006	0	0	0	0	0	0	0
5	017	001	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0